

REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-14, 16-20 and 22-26 are active in this application; Claims 15, 21 and 27 having been withdrawn from consideration.

In the outstanding Office Action the drawings were objected to requiring changes to Figure 6, and Claims 1-14, 16-20 and 22-26 stand rejected under 35 USC §102(e) as being anticipated by Lengyel (US Patent 6,573,890 B1).

In response to the objection to the drawings, the specification has been amended to refer to step S72 of FIG. 6, whereby the drawing objection is believed to have been overcome.

Applicants respectfully traverse the outstanding rejection on the merits, because Applicants believe that the claimed invention patentably distinguishes over the cited art for the reasons next discussed.

Briefly recapitulating, in order to represent object region data in a moving picture in any shape and express data on object position, size, and shape precisely, the object is approximated in a polygonal shape. If a time-series variation of an object is expressed by polygon approximation, the movement of each vertex that is polygon approximated is described. However, in order to serially record a position of the vertex of each frame, there is a problem that a large amount of data is required, which is inconvenient.¹

According to the present invention, the vertex association unit, for example unit 102, associates corresponding vertexes of approximation polygons between adjacent frames in a linking manner with regard to the vertexes of approximation polygons generated over a

¹ Specification, page 2, line 12 to page 4, line 21.

plurality of frames with regard to each object, and generates a trajectory of the vertexes of the approximation polygons over a plurality of frames with regard to each object. For example, when a vertex of an approximation polygon in which a region of an object in a frame is approximated is associated with a vertex of the corresponding polygon of the adjacent frame, thereby obtaining a trajectory of the vertex, a distance between the vertex in one frame and the associated vertex of the adjacent frame may be determined so as to be minimum. Before obtaining this distance, two polygons may be aligned with each other so that their centers of gravity coincide with each other. In addition, for example, a position of a vertex of the adjacent frame is estimated from a trajectory of the already associated vertex so that a distance between the estimated vertex and a vertex in the adjacent frame may be determined so as to be minimum. Further, for example, the characteristic quantity in vertexes of a polygon is calculated so that a vertex having its closest characteristic quantity in the adjacent frame may be associated with another vertex.²

According to an embodiment of Applicants' invention, it is possible to approximate the size, shape, movement, deformation or the like, of a region of a desired object in a moving picture, as a polygon, with high precision and high speed. In addition, the region of the desired object in the moving picture is described in a small amount of data, making it possible to object generation or data processing.³

Lengyel does not teach approximating the object region in each of the frames with a polygon, the polygon having vertexes and does not teach associating the vertexes in each of the frames with the respective vertexes in an adjacent frame of each of the frames. Though the outstanding Office Action refers to col. 4, lines 43-56 of Lengyel, Lengyel merely teaches

² Id., page 15, line 10 to page 16, line 13.

³ Id., page 45, line 25 to page 46, line 8.

that the motion of an animated 3D object can be expressed in a matrix P of 3D positions and a 3D position is a vertex position in a 3D mesh. The object region is not approximated with the polygon. Furthermore, though the outstanding Office Action refers to col. 15, lines 11-20 of Lengyel, Lengyel merely teaches that adder module 136 combines the residual 3D position data computed for the current frame with the transformed version of the of the previous frame and stores the resulting approximation of the current mesh in memory 126. Lengyel does not teach associating the vertexes in each of the frames with the respective vertexes in an adjacent frame of each of the frames.

On the contrary, Lengyel teaches a cluster segmentation problem in which “multiple assignment is allowed, so that each vertex may belong to a set of clusters and have an associated weight. Each cluster has an associated time-varying coordinate frame C that is given or calculated based on the vertices that are members of the cluster.” It is respectfully submitted that Lengyel in this regard clearly teaches a different approach than Applicants’ invention wherein the vertexes in each of the frames are associated with the respective vertexes in an adjacent frame of each of the frames. In view of this distinction, it is respectfully submitted that Claims 1, 16, and 22 patentably define over Lengyel.

Turning now to the rejection of Claims 2, 17, and 23, the outstanding Office Action refers to col. 8, lines 56-67 and col. 21, lines 53-66 of Lengyel. However, Lengyel merely teaches a vertex expansion list. The top row of the matrix denotes splits in the spatial hierarchy of the time-dependent geometry. Subsequent rows in the matrix correspond to increments of time. Columns in the matrix correspond to delta values between neighboring levels of hierarchy in the spatial domain. In the current implementation, the contraction coefficients run from right to left and, conversely, expansion coefficients run from left to right. Due to the structure of the refinement procedure, the magnitudes of the delta vectors

stored at each element in the matrix decrease from left to right. Intuitively, this is because the first edges to be collapsed perturb the original mesh the least, by design. There is more signal strength on the left hand side of the matrix, and it becomes progressively smaller from left to right in the matrix. Lengyel does not teach that the vertexes in each of the frames are associated with the respective vertexes in the adjacent frame such that a distance between the vertexes in each of the frames and the respective vertexes in the adjacent frame is minimum.

With regard to claims 12, 20, and 26, the outstanding Office Action refers to col. 16, lines 37-50. However, Lengyel merely teaches making the column re-ordering transparent to the decoder. The encoder renumbers the indices in the triangle list to correspond to the sorted columns in the vertex matrix. Lengyel does not teach estimating a plurality of vertexes of the polygon in a given frame based on trajectory data indicating vertexes of the polygon from a first frame to an immediately preceding frame of the given frame, and modifying the plurality of vertexes estimated so as to be associated with the object region in the given frame.

In view of the above comments, it is respectfully submitted that Lengyel clearly does not anticipate the claimed invention and that the outstanding rejection is traversed. Accordingly, no further issues are believed to be outstanding, and it is respectfully submitted that the present application is in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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